

PARASITIC WASPS OF THE GENUS *DICLADOCERUS* (HYMENOPTERA:  
EULOPHIDAE) FROM NORTHERN INDIA<sup>1</sup>

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(With forty text-figures)

Additional generic characters of pronotum, subgenital plate and external female genitalia are suggested for the genus *Dicladocerus* Westwood. The genus is reported for the first time from India. Four new species *D. indicus*, *D. antennalis*, *D. liriomyza* and *D. viginaii* are described in detail. Key to the Indian species of the genus *Dicladocerus* is given.

INTRODUCTION

During a survey of insect pests of agricultural importance in northern India, I found four new species of (Eulophidae) parasitizing agromyzid species (Diptera).

These species are finely sculptured on the head and thorax, scutellum having a pair of longitudinal grooves. They belong to the genus *Dicladocerus* Westwood and constitute the first valid record of the genus in India.

*Abbreviations:* Funicular segments 1 to 3-F1, F2, F3, submarginal vein-smv; marginal vein-mv; stigmal vein-stv; cubital vein-cu, first valvifers-vf1; second valvifers-vf2; third valvulae-v3.

Genus *Dicladocerus* Westwood

*Dicladocerus* Westwood, 1832. Phil. Mag, (3) 1: 128. Type species: *Dicladocerus westwoodi*, by monotype.

**Diagnosis:** The generic diagnostic characters can be summed up as head transverse-subtriangular; eyes ovate and somewhat subprominent; gena about 1/2 to 1/3 length of eye; ocelli obtusely triangular; antennae inserted

below, above or at ventral margin of eye; scape slender, reaching anterior ocellus; pronotum, mesoscutum and scutellum densely sculptured with latter having a pair of sublateral longitudinal grooves; median carina of propodeum generally weak and complete in female, plica usually weak and complete in female; wings hyaline; costal cell broad with a horizontal row of hairs on the lower surface extending from end to end, prestigma as long as stigmal vein and post marginal vein; abdomen elongately ovate to elongately lanceolate, apex acuminate; fore and middle coxae finely striate to strigose and hind coxae strongly sculptured.

In addition, some new generic characters are also suggested which will further facilitate the identification of this genus, namely posterior margin of pronotum without submarginal ridge with a small protuberance on each side, antero-lateral angle obtuse and laterally directed; subgenital plate broad, posterior margin with a notch in the middle; outer plate of ovipositor narrow at base, gradually widening posteriorly.

DISCUSSION

The genus *Dicladocerus* Westwood belongs to the subfamily Eulophinae (Eulophidae) and is distinguished from the related genera by the characters mentioned above. The genus fits very conveniently in the key Peck *et al.* (1964) and is apparently close to *Ratzeburgiola* Erdos. The

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structure of propodeum in the genus *Ratzeburgiola* with a median carina; sublateral plicae and transverse costula (as in *Pnigalio* Schrank, Boucek 1988, Fig. 1097); mesoscutum shining with numerous bristles; pmv at least twice as long as sv, female funicle always with four segments which separates the genus from *Di cladocerus*. Peck (1963) listed three species of *Di cladocerus* from North America. Boucek and Askew (1969) recognised four species of this genus from Europe. Boucek (1975) treated *Necremnus propodealis* Boucek as a synonym of *D. breviramulus* Boucek. Askew and Godfray (1987) confirmed the synonymy of *D. enryalus* (Haliday) and *D. aeneiscapus* (Thomson). Yoshimoto (1976) while making a revision of the genus has described twelve species from North America and one from Japan and has formulated its generic characters. Recently Hussain and Khan (1986) incorrectly declared *Solenotus guptai* (Subba Rao 1957) to be in *Di cladocerus* but it does not show any of the generic characters of the latter.

**Biology:** Primary parasitoids of Lepidoptera (Coleophoridae) and Diptera (Agromyzidae).

**Distribution:** Europe, England, North America, United States, Canada, British Columbia, Nearctic region, Asia, Central Japan, India.

In the present work four new species are described. A key to the Indian species is also proposed.

KEY TO THE INDIAN SPECIES OF THE GENUS *Di cladocerus* WESTWOOD BASED ON FEMALES

1. Frontovortex with reticulate sculpture; postocellar line almost or two times as long as ocellular . . . . 2  
Frontovortex reticulate-punctate, big puncture clear; postocellar line one and one-half times as long as ocellular; scrobes distinct and deep, convergent, interscrobal region rigid, surface of propodeum shagreened, smooth to alutaceous except sides of median carina micro-reticulate, median carina thin and moderately elevated anteriorly. *D. indicus* sp. nov.
2. Frontovortex one-half or less than one-half the total

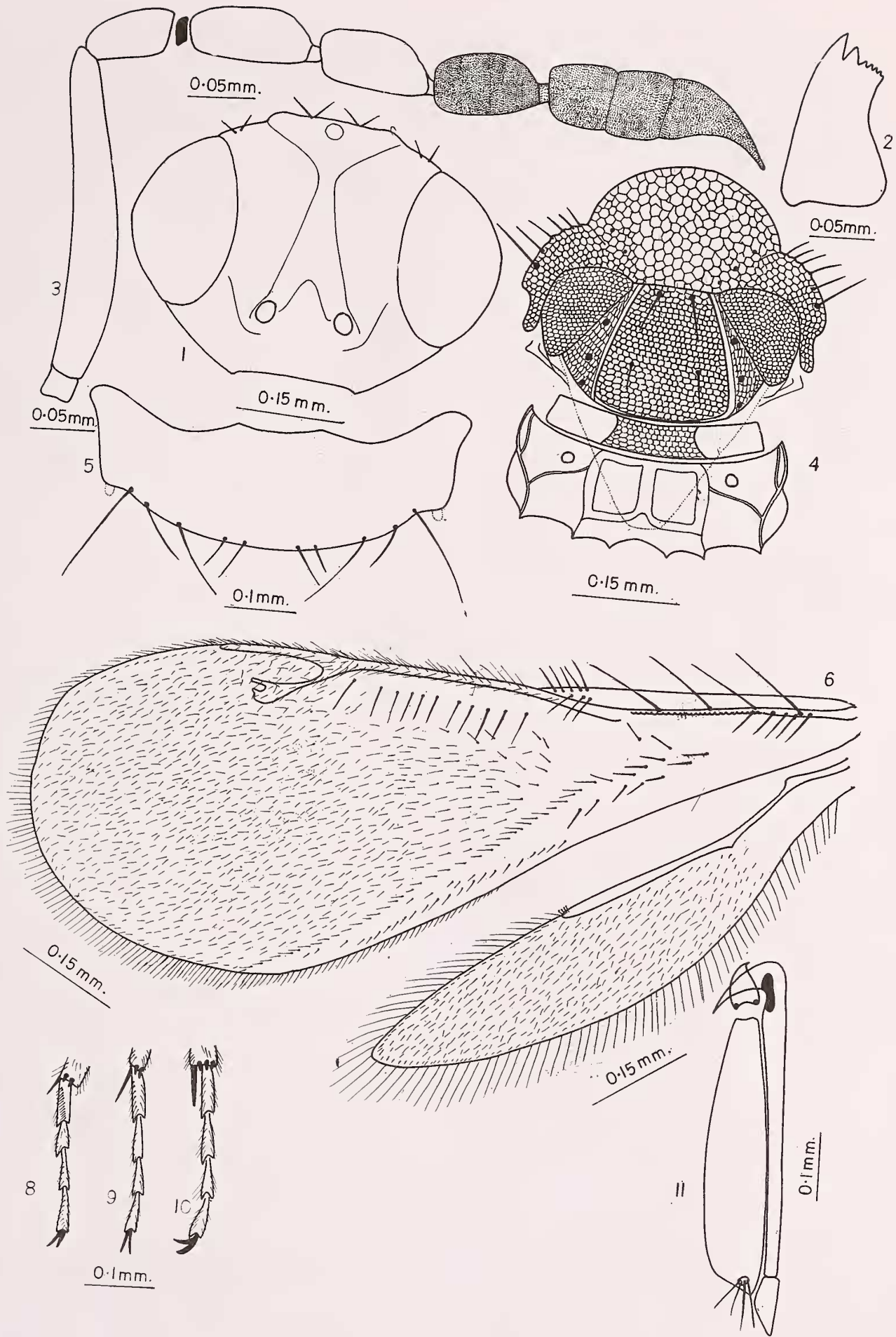
- head width; pedicel less than two times as long as wide, distinctly shorter than F1. . . . . 3  
Frontovortex more than one-half the total head width; pedicel long, less than three times as long as wide, distinctly longer than F1; F1 two times as long as wide' F2 a trifle longer than wide, F3 transverse, distinctly wider than long; club longer than preceding two funicle segments combined. . . . .  
. . . . . *D. antennalis* sp. nov.
3. Antennae dark brown with two ring segments; prominence between antennal sockets less than one-fourth the width of frons between eyes; speculum narrow, pmv two times as long as stv, third valvulae four times as long as wide. . . *D. liriomyza* sp. nov.  
Antennae uniformly yellowish except F3 and club dark brown with only one ring segment, prominence between antennal sockets less than one-third the width of frons between eyes; speculum moderate, pmv longer than stv, third valvulae less than three times as long as wide. . . . . *D. viggianii* sp. nov.

***Di cladocerus viggianii* sp. nov.<sup>3</sup>**  
(Figs. 1-11)

**FEMALE:** Body length 1.29 mm. General body colour black, non-iridescent; head black, ocelli white, eyes silvery; antennae uniformly yellowish except F3 and club dark brown; thorax black except scutellum with a yellow patch in the middle; wings hyaline; legs white except fore coxa on greater part infuscated and middle femora with an opaque band in the middle; abdomen dark brown except basal one-third with a yellow patch.

**Head:** (Fig. 1) Much wider than long in facial view (0.54: 0.38); sparsely setose; frontovortex width less than one-half the total head width ((0.24: 0.54); ocelli arranged in obtuse triangle; postocellar line almost two times as long as ocellular; eyes silvery; malar suture absent; malar space with three long setae on

<sup>3</sup>This species is named for Dr. G. Viggiani in recognition of his valuable contribution to our knowledge of the Chalcidoidea.



Figs. 1-11. *Di cladocerus viggianii* sp. nov.

1. Head, in frontal aspect; 2. Mandible; 3. Antenna; 4. Thorax; 5. Pronotum; 6. Fore wing; 7. Hind wing; 8. Part of fore leg; 9. Part of middle leg; 10. Part of hind leg; 11. Ovipositor.

either side; slightly shorter than eye width (0.14: 0.15); antennae inserted at lower level of eyes; prominence between antennal sockets less than one-third the width of frons between eyes (0.09: 0.24); mandibles bidentate with acute teeth and serration (Fig. 2), maxillary and labial palpi two and one segmented respectively.

**Antennae** (Fig. 3): Eight segmented excluding one ring segment; scape cylindrical, almost seven times as long as wide (0.24: 0.035); pedicel less than two times as long as wide (0.06: 0.035), distinctly shorter than F1; funicle three segmented; F1 very long; two times as long as wide (0.09: 0.045), F2 less than two times as long as wide (0.08: 0.045); F3 as long as F2 but slightly wider, distinctly less than two times as long as wide (0.08: 0.05); club three segmented, more than three and a half times as long as wide (0.17: 0.05), longer than preceding two funicle segments together.

**Thorax** (Fig. 4): Pronotum (Fig. 5) with posterior margin without submarginal ridge bearing six very long and twenty small sized bristles with a small protuberance on each side, antero-lateral angles obtuse and laterally directed; mesoscutum more than two times wider than long (0.4: 0.17), microreticulate; with three pairs of long setae; parapsidal grooves complete, faintly indicated; scutellum wider than long (0.28: 0.19), longer than mesoscutum, microreticulate; sublateral longitudinal grooves distinct; lateral area beyond scutellar grooves 2/3 micro-reticulate and 1/3 scalyreticulate; with three pairs of long setae; propodeum with median carina.

**Fore wings** (Fig. 6): Less than three times as long as wide (1.27: 0.48); costal cell with five setae directed upward and three setae directed backward at apical end; basal vein with only three setae; basal cell bare; speculum moderate and closed below; cu sinuate; smv long (0.47) with four long setae directed upward and a row

of five small setae directed backward; longer than mv (0.32); pmv (0.15) longer than stv (0.11); eleven admarginal hairs present; marginal fringe short.

**Hind wings** (Fig. 7): Less than five times as long as wide (0.87: 0.17), with acute apex; marginal fringe moderate size.

**Fore legs** (Fig. 8): Tarsal segments densely setose, tibial spur very short, apical rim of tibiae with two pegs.

**Middle legs** (Fig. 9): Tarsal segments densely setose; tibial spur shorter than basitarsus, apical rim of tibiae with two pegs.

**Hind legs** (Fig. 10): Tarsal segments densely setose; tibial spur shorter than basitarsus, apical rim of tibiae with three pegs.

**Abdomen petiolate:** Longer than head and thorax together; T1 well developed reaching beyond the middle of abdomen; ovipositor slightly exerted, arising from basal one-half of abdominal venter; Vf1 (Fig. 11) triangular with basal and apical angles at different level, v3 short (Fig. 11) less than three times as long as wide, less than one-sixth the length of vf2 (Fig. 11); outer plates of ovipositor distinctly shorter than vf3 (Fig. 11).

MALE: Not known.

**Holotype:** ♀ INDIA, U.P., Bhimtal, ex. *Agromyza* sp. (Diptera: Agromyzidae) on *Trifolium alexandrium* Linn. (Leguminosae), 1-5-1986.

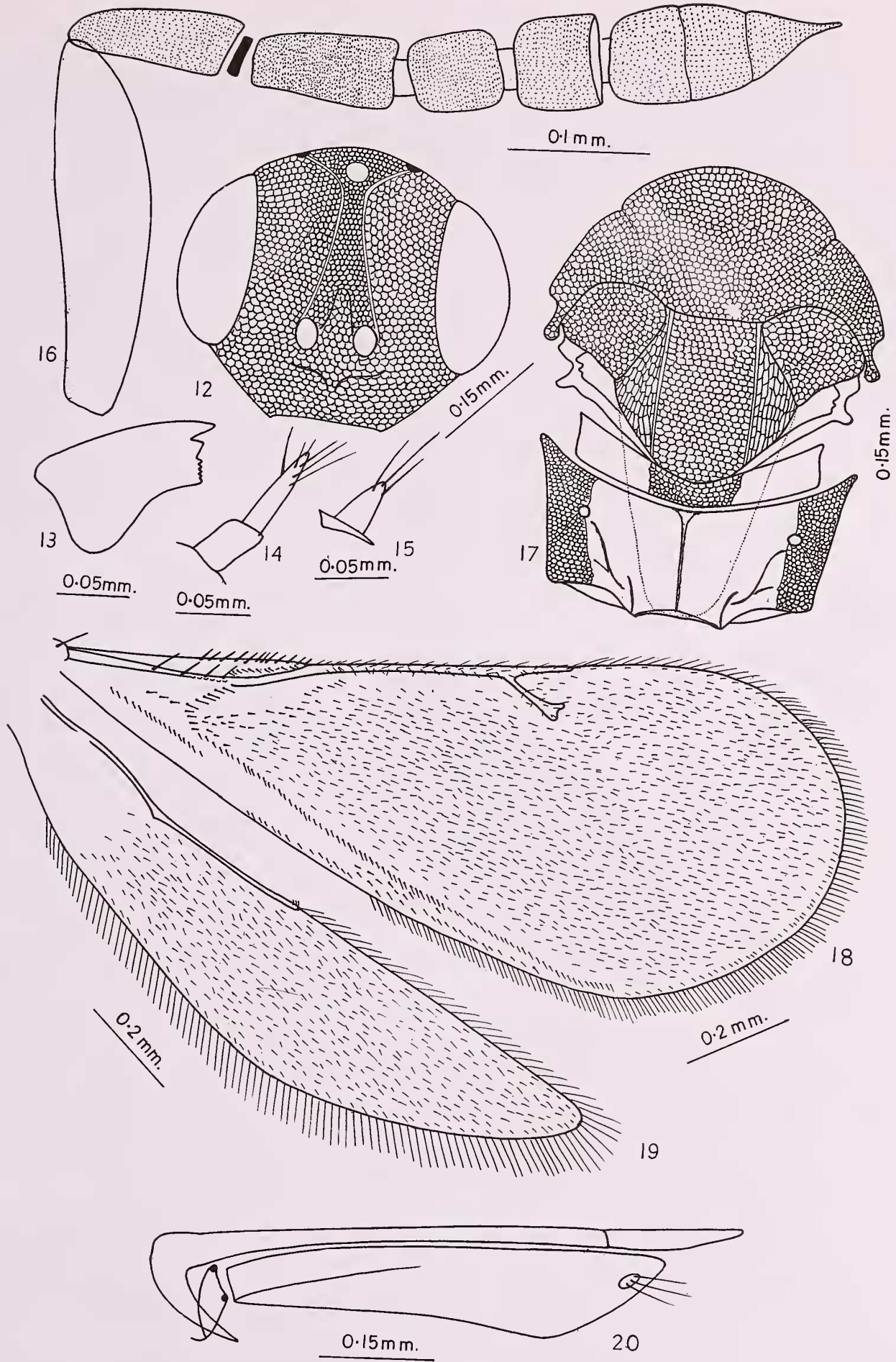
**Paratype:** 6 ♀♀ same data as holotype.

The holotype and 3 paratypes will be deposited in the Z.S.I. Calcutta, India; remaining paratypes are retained in the author's collection.

### ***Dicladocerus antennalis* sp. nov.**

(Figs. 12-20)

FEMALE: Body length 1.31 mm. General body colour dark brown; antennae light brown except scape white; wings hyaline; legs



Figs. 12-20 *Di cladocerus antennalis* sp. nov. ♀

12. Head, in frontal aspect; 13. Mandible; 14. Maxillary palp; 15. Labial palp; 16. Antenna; 17. Thorax; 18. Fore wing; 19. Hind wing; 20. Ovipositor.

yellowish except fore coxa and femora light brownish, middle coxa at its basal end infuscated; abdomen dark brown except apical one-third yellowish.

**Head** (Fig. 12): With fine reticulate sculpture, wider than long in facial view (0.44: 0.38), frontovertex wider than long, width more than one-half the total head width (0.24: 0.44), ocelli dark, arranged in obtuse triangle, postocellar line two times as long as ocellular; antennae inserted well above lower level of eyes; prominence between antennal sockets almost one-fifth the width of frons between eyes (0.05: 0.24); malar space longer than eye width (0.13: 0.01), malar suture absent, mandibles with acute teeth and serration (Fig. 13), maxillary (Fig. 14) and labial palpi (Fig. 15) two and one segmented respectively.

**Antennae** (Fig. 16): Eight segmented excluding one ring segment; scape cylindrical, less than four times as long as wide (0.26: 0.07), pedicel long, less than three times as long as wide (0.11: 0.04) distinctly longer than F1; F1 two times as long as wide (0.1: 0.05), F2 a trifle longer than wide (0.065: 0.06), F3 transverse, distinctly wider than long (0.7: 0.55), club three segmented, almost two and a half times as long as wide (0.17: 0.07), longer than preceding two funicle segments together.

**Thorax** (Fig. 17): Pronotum with fine reticulate sculpture, posterior margin with five pairs of setae; mesoscutum more than two times wider than long (0.44: 0.21), microreticulate sculpture; parapsidal furrows faintly indicated; scutellum slightly wider than long (0.24: 0.23) micro-reticulate, sublateral longitudinal grooves distinct, lateral area beyond scutellar grooves scaly reticulate; axillae finely and broadly reticulate; propodeum finely reticulate to alutaceous except along periphery of plica reticulate regulose, more than half the length of scutellum, median carina thin, elevated towards

anterior half, anterior part of plica thickened, moderately elevated on ridge, reaching spiracle at the distance of half its diameter; spiracles separated from the anterior margin of propodeum; mesopostphragma not reaching beyond propodeum.

**Fore wings** (Fig. 18): More than two times as long as wide (1.47: 0.61); broadly spatulate; costal cell with twelve setae on anterior margin of its apical half and twelve small setae directed backward in the middle; basal vein with six setae; basal cell setose; cu sinuate; speculum almost reduced and closed below; smv with four strong setae, longer (0.46) than mv (0.4); pmv (0.09) shorter than stv (0.1), marginal fringe short.

**Hind wings** (Fig. 19): More than four times as long as wide with acute apex; marginal fringe moderate size.

**Legs**: Fore and hind tibial spur short, middle tibial spur shorter than basitarsus; apical rim of middle and hind tibiae with two and one peg respectively.

**Abdomen**: shorter than head and thorax together; ovipositor slightly exerted; vf1 semicircular (Fig. 20); v3 (Fig. 20) long, seven times as long as wide, lanceolate, more than one-third the length of vf2, outer plates of ovipositor (Fig. 20) shorter than vf2.

MALE: not known.

**Holotype**: ♀ INDIA, U.P., Dehradun, ex. *Calycomyza humeralis* sp. (V. Roser) (Diptera: Agromyzidae) on *Blumea membranacea* DC. (Compositae), 20-4-1987.

**Paratype**: 2 ♀♀ same data as holotype.

The holotype and 1 paratype will be deposited in the Z.S.I. Calcutta, India, remaining paratype is retained in the author's collection.

### **Di cladocerus indicus** sp. nov.

(Figs. 21-29)

FEMALE: Body length 1.81 mm. General body

colour dark brown with blue-green iridescence; antennae dark brown; wings hyaline; legs dark brown except middle legs with apical half of trochanter, apical tip of femora, basal one-fourth of tibia and basitarsus white.

**Head:** Reticulate sculpture with big punctures on frons, vertex; transverse subtriangular, distinctly wider than long in facial aspect; frontovertex wide, more than one-half the total head width (0.3: 0.58); scrobes distinct and deep, convergent, inter scrobal region rigid; postocellar line one and one-half times as long as ocellular; antennae inserted at the level of ventral margin of eye, prominence between antennal sockets slightly more than one-third the width; eyes dark; mandibles (Fig. 21) with acute teeth and serrations; maxillary (Fig. 22) and labial palpi each one segmented (Fig. 23).

**Antennae** (Fig. 24): Dark brown, eight segmented excluding two ring segments; scape cylindrical, more than five times as long as wide (0.29: 0.055); pedicel less than two times as long as wide (0.085: 0.05), more than half the length of F1; funicle three segmented, segments gradually decreasing in length distad but increasing in width; F1 more than two times as long as wide (0.14: 0.06); F2 less than two times as long as wide (0.115: 0.07); F3 shortest, longer than wide (0.11: 0.08); club three segmented, three times as long as wide (0.24: 0.08), longer than preceding two segments together.

**Thorax** (Fig. 25): With fine reticulate sculpture; pronotum with anterior margin slightly concave, posterior margin slightly curved bearing three pairs of setae; mesoscutum less than two times wider than long (0.63: 0.33), coarsely reticulate; parapsidal furrows distinct anteriorly and faint posteriorly; scutellum wider than long (0.54: 0.33), micro reticulate, sublateral longitudinal grooves distinct, lateral area beyond scutellar grooves scaly reticulate;

axillae finely reticulate; surface of propodeum shagreened, smooth to alutaceous except sides of median carina micro-reticulate, median carina thin and moderately elevated anteriorly, spiracles almost contiguous with anterior margin of propodeum.

**Fore wings** (Fig. 26): Less than three times as long as wide (2.24: 0.86), broadly spatulate; costal cell short with three rows of hairs; basal vein with eight setae; basal cell with three setae; speculum narrowly longitudinal extending to base of mv, closed below; cu sinuate, partially closed, subcubital line of hairs broken for a short distance about one-third of distance from base; smv long (0.72) with eight long setae directed apically and a row of small eight setae at basal region directed backward, longer than mv (0.5), mv almost three times as long as stv, pmv (0.3) distinctly less than two times as long as stv (0.17); fifteen admarginal hairs present; marginal fringe short.

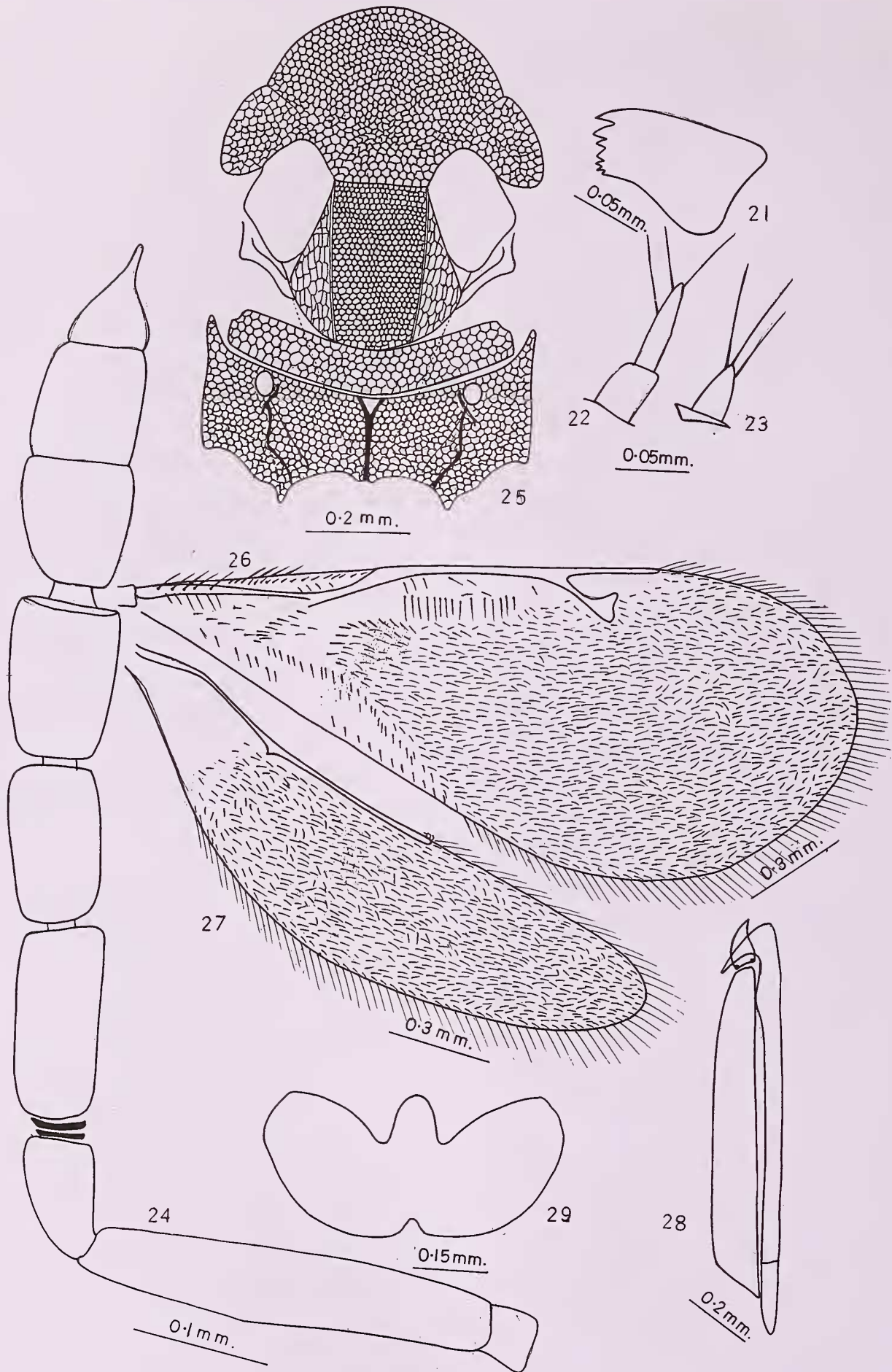
**Hind wings** (Fig. 27): More than four times as long as wide (1.71: 0.41), broadly spatulate; marginal fringe long.

**Legs:** Tibial spur of fore and hind legs short, middle tibial spur shorter than basitarsus; apical rim of tibia and tarsal segments of all the legs densely setose.

**Abdomen:** Longer than head and thorax together; ovipositor exerted, arising from basal one-third of abdominal venter; vf1 (Fig. 28) triangular with articular knobs prominent, basal and apical angles at different levels; v3 short (Fig. 28) almost four times as long as wide, almost one-fifth the length of vf2 (Fig. 28); outer plates of ovipositor (Fig. 28) almost as long as vf2; subgenital plate broad, posterior margin with a notch in the middle (Fig. 29).

MALE: Not known.

**Holotype:** INDIA, U.P., Ramnagar ex. *Tropicomyia vigneae* (Seguy) (Diptera: Agromyzidae) on *Dolichos lablab* Linn.



Figs. 21-29 *Dicladocerus indicus* sp. nov. ♀  
 21. Mandible; 22. Maxillary palp; 23. Labial palp; 24. Antenna; 25. Thorax; 26. Fore wing; 27. Hind wing; 28. Ovipositor; 29. Sub-genital plate.



(Leguminosae), 28-5-1986.

**Paratype:** 4 ♀♀ same data as holotype.

The holotype and 2 paratypes will be deposited in the Z.S.I. Calcutta, India; remaining paratypes are retained in the author's collection.

***Di cladocerus liriomyza* sp. nov.**  
(Figs. 30-40)

**FEMALE:** Body length 1.73 mm. General body colour dark bluish green with golden reflections; ocelli white, antennae dark brown; wings hyaline; fore legs uniformly dark brown except apical tip of femora and basal half of basitarsus white, middle and hind legs uniformly light brown except apical tip of femora, basal tip of tibiae and basitarsus white, tarsal segments 2-4 infuscated.

**Head** (Fig. 30): with fine reticulate sculpture; wider than long in facial aspect (0.64: 0.44); frontovertex width one-half the total head width (0.34: 0.68); scrobes deep and convergent above; ocelli arranged in obtuse angle triangle, postocellar line almost two times as long as ocellocular; antennae inserted just on the lower level of eyes; prominence between antennal sockets less than one-fourth the width of frons between eyes (0.09: 0.34); malar space shorter than eye width (0.14: 0.16); malar suture not distinct; eyes dark; mandibles with acute teeth and serrations (Fig. 31), maxillary (Fig. 32) and labial palpi (Fig. 33) two and one segmented respectively.

**Antennae** (Fig. 34): eight segmented excluding two ring segments; scape cylindrical, more than four times as long as wide (0.22: 0.04); pedicel less than two times as long as wide (0.08: 0.05), more than one half the length of F1; funicle three segmented, F1 segment more than two times as long as wide (0.13: 0.06), F2 less than two times as long as wide (0.11: 0.06), F3 as long as F2 but a trifle wider (0.11: 0.065);

club three segmented, more than three times as long as wide (0.11: 0.07), longer than preceding two funicle segments together.

**Thorax** (Fig. 35): pronotum (Fig. 36) with posterior margin slightly curved, posterior submarginal ridge bearing three pairs of setae, its mid dorsal area coarsely reticulate, anterior two-third strigose; mesoscutum more than two times wider than long (0.61: 0.23), coarsely reticulate; scutellum somewhat flattened in the middle, less than two times wider than long (0.52: 0.33), micro-reticulate, sub-lateral longitudinal grooves distinct, lateral area beyond scutellar grooves scaly reticulate; axillae finely reticulate; median carina of propodeum weak and complete.

**Fore wings** (Fig. 37): more than two times as long as wide (1.8: 0.8) broadly spatulate; costal cell broad with two rows of hairs extending from end to end; basal cell bare; speculum narrow, closed below; cu sinuate; subcubital line of hairs long, starting from the base of cu; smv long (0.6) with twelve long setae, longer than mv (0.48); mv less than two times as long as stv; pmv (0.24) less than two times as long as stv (0.13), thirteen admarginal hairs present; marginal fringe short.

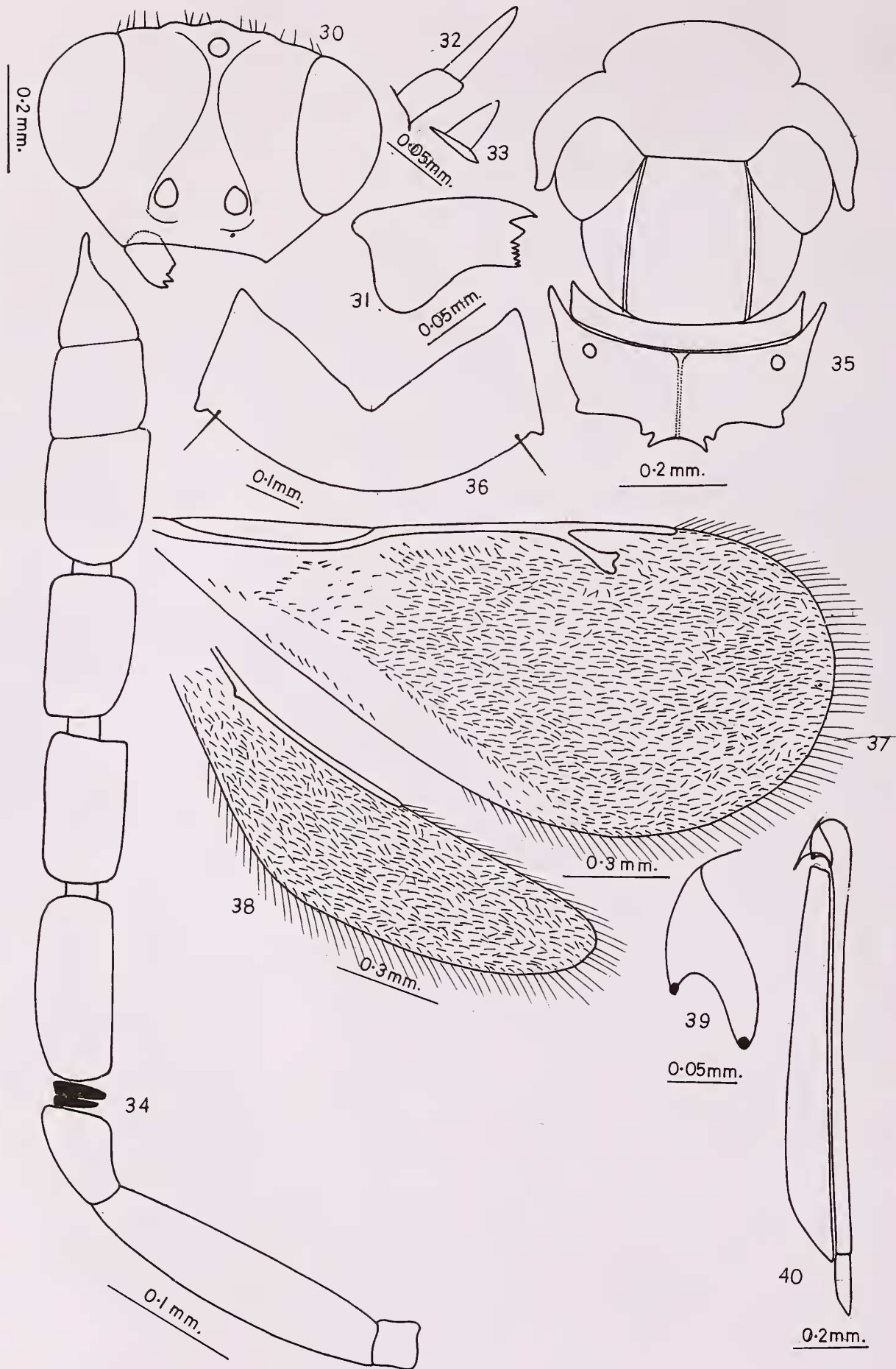
**Hind wings** (Fig. 38): less than four times as long as wide with blunt apex; marginal fringe moderate size.

**Fore legs:** tibial spur very short; coxa finely striate to strigose.

**Middle legs:** tibial spur short; coxa finely striate to strigose.

**Hind legs:** tibial spur shorter than basitarsus, densely setose; coxa coarsely reticulate sculptured.

**Abdomen:** longer than head and thorax together, ovipositor slightly exerted, arising from basal one-third of abdominal venter; vfl (Fig. 39) triangular with basal and apical angles at different levels; v3 (Fig. 40) short, lanceolate,



Figs. 30-40 *Di cladocerus liriomyza* sp. nov. ♀  
 30. head, in the frontal aspect; 31. Mandible; 32. Maxillary palp; 33. Labial palp; 34. Antenna; 35. Thorax; 36. Pronotum; 37. Fore wing; 38. Hind wing; 39; First valvifer; 40; Ovipositor

almost four times as long as wide, one-seventh the length of  $vf_2$  (Fig. 40); outer plates of ovipositor (Fig. 40); distinctly shorter than  $vf_2$ .

MALE: not known.

**Holotype:** ♀, INDIA, U.P., Kathgodam ex. *Liriomyza compositella* (Malloch) Spencer (Diptera: Agromyzidae) on *Xanthium strumarium* Linn. (Compositae), 27-8-1986.

**Paratype:** 4 ♀♀ same data as holotype.

The holotype and 2 paratypes will be deposited in the Z.S.I., Calcutta, India; remaining paratypes are retained in the author's collection.

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- \* Original not seen.